

CLAIMS

1. Zoom apparatus for digital image processing comprising:
an optical zoom lens arranged to provide an image across a continuous zoom range;
an image sensor arranged to receive an image from the optical zoom lens and to provide a digital representation of the image; and
digital zoom apparatus arranged to apply (a) one of at least two discrete zoom levels to the digital representation of the image such that the total apparent zoom level is the product of the discrete digital zoom level and the optical zoom level, and (b) digital interpolation to the digital representation of the image during a transition period between discrete zoom levels.
2. Zoom apparatus according to claim 1, wherein during the transition period between discrete zoom levels the optical zoom lens is arranged to be adjusted to substantially compensate for the change in discrete digital zoom level.
3. Zoom apparatus according to claim 2, wherein the optical zoom lens is arranged to be automatically adjusted to a point in the optical zoom lens zoom range that provides, as a product of zoom level with the changed digital zoom level, a total apparent zoom level substantially equal to the zoom level provided by the digital interpolation.
4. Zoom apparatus according to claim 3, wherein the zoom lens is arranged to be automatically adjusted from a first end of the zoom range of the zoom lens towards a second end of the zoom range during the transition period between discrete zoom levels.

5. Zoom apparatus according to claim 4, wherein the transition period between discrete zoom levels is arranged to be initiated only at the end points of the optical zoom lens zoom range.

6. Zoom apparatus according to claim 5, wherein the digital zoom apparatus is arranged to apply the digital interpolation such that the rate of change of total apparent zoom level is substantially equal to the rate of change of zoom level provided by the optical zoom lens.

7. Zoom apparatus according to claim 6, wherein the discrete digital zoom levels are arranged to be provided by applying discrete charge binning schemes.

8. Zoom apparatus according to claim 1, wherein the zoom lens is arranged to be automatically adjusted from a first end of the zoom range of the zoom lens towards a second end of the zoom range during the transition period between discrete zoom levels.

9. Zoom apparatus according to claim 1, wherein the transition period between discrete zoom levels is arranged to be initiated only at the end points of the optical zoom lens zoom range.

10. Zoom apparatus according to claim 1, wherein the digital zoom apparatus is arranged to apply the digital interpolation such that the rate of change of total apparent zoom level is substantially equal to the rate of change of zoom level provided by the optical zoom lens.

11. Zoom apparatus according to claim 1, wherein the discrete digital zoom levels are arranged to be provided by applying discrete charge binning schemes.

12. A method of operating a zoom apparatus, the method comprising:
operating on optical zoom lens across a continuous zoom range to provide an optical image;

applying one of a plurality of discrete digital zoom levels to a digital representation of the optical image such that the total apparent zoom level is the product of the discrete digital zoom level and the optical zoom level; and

applying digital interpolation to the digital representation of the image during a transition period in which the level of discrete digital zoom is changed.

13. A method according to claim 12, further including substantially compensating for the change in discrete digital zoom level by adjusting the optical zoom lens, the adjusting step being during the transition period.

14. A method according to claim 13 further including returning the zoom lens to a point in the optical zoom range that provides a product of optical zoom level with the changed discrete digital zoom level a total apparent zoom level substantially equal to the zoom level provided by the digital interpolation.

15. A method according to claim 14, further including returning the zoom lens from the end point of the zoom range reached immediately prior to the transition period towards the opposite end point of the zoom range.

16. A method according to claim 15, further including initiating the transition period in which the level of discrete digital zoom is changed only at the end points of the zoom range provided by the optical zoom lens.

17. A method according to claim 16, wherein the digital interpolation is applied such that the rate of change of total apparent zoom level is substantially equal to the rate of change of zoom level provided by the optical zoom lens.

18. A method according to claim 17, wherein each of the plurality of discrete digital zoom levels is provided by applying a discrete charge binning scheme.

19. A method according to claim 12, further including returning the zoom lens from the end point of the zoom range reached immediately prior to the transition period towards the opposite end point of the zoom range.

20. A method according to claim 12, further including initiating the transition period in which the level of discrete digital zoom is changed only at the end points of the zoom range provided by the optical zoom lens.

21. A method according to claim 12, wherein the digital interpolation is applied such that the rate of change of total apparent zoom level is substantially equal to the rate of change of zoom level provided by the optical zoom lens.

22. A method according to claim 12, wherein each of the plurality of discrete digital zoom levels is provided by applying a discrete charge binning scheme.

23. A digital camera in combination with the zoom apparatus according to claim 1.